

What is Claimed:

- 1 1. A process for fabricating an oxide, the process comprising:
 - 2 (a) forming a first oxide portion over a substrate at a temperature below a
 - 3 threshold temperature; and
 - 4 (b) forming a second oxide portion under said first oxide portion at a
 - 5 temperature above said threshold temperature.
- 1 2. A process as recited in claim 1, wherein the process further comprises:
 - 2 (c) cooling said substrate at a controlled rate so that said first oxide portion
 - 3 acts as a stress sink for said second oxide portion .
- 1 3. A process as recited in claim 1, wherein step (a) further comprises:
 - 2 increasing an ambient temperature from an initial temperature to a first
 - 3 temperature at a first rate; and
 - 4 increasing said ambient temperature from said first temperature to said
 - 5 temperature below said threshold temperature at a second rate.
- 1 4. A process as recited in claim 1, wherein said substrate is oxidizable
- 2 silicon and said threshold temperature is the viscoelastic temperature of silicon dioxide.
- 1 5. A process as recited in claim 3, wherein said first temperature is
- 2 approximately in the range of 750°C to 850°C and said first rate is approximately in the
- 3 range of 50°C to 125°C per minute.
- 1 6. A process as recited in claim 3, wherein said temperature below said
- 2 threshold temperature is approximately in the range of 800°C to 900°C and said second
- 3 rate is approximately in the range of 10°C to 25°C.
- 1 7. A process as recited in claim 1, wherein step (b) further comprises:
 - 2 increasing an ambient temperature from a first temperature to a second
 - 3 temperature at a first rate; and
 - 4 increasing said ambient temperature from said second temperature to said
 - 5 temperature above said threshold temperature at a second rate.

1 8. A process as recited in claim 7, wherein said temperature above said
2 threshold temperature is in the range of approximately 925°C to 1100°C.

1 9. A process as recited in claim 7, wherein said first rate is approximately
2 in the range of 5°C to 15°C per minute and said second temperature is approximately in
3 the range of 875°C to 1050°C.

1 10. A process as recited in claim 7, wherein said second rate is
2 approximately in the range of 5-10°C per minute and said temperature above said
3 threshold temperature is approximately in the range of 925°C to 1100°C.

1 11. A process as recited in claim 7, wherein said temperature above said
2 threshold temperature is maintained for a period of time and in an oxidizing ambient.

1 12. A process as recited in claim 11, wherein said oxidizing ambient
2 includes an oxygen concentration of 0 to 25%.

1 13. A process as recited in claim 2, wherein said cooling further
2 comprises:

3 reducing an ambient temperature from said temperature above said
4 threshold temperature to an intermediate temperature at a first rate; and

5 reducing said ambient temperature to a final temperature at a second rate.

1 14. A process as recited in claim 13, wherein said first rate is
2 approximately in the range of 2°C to 5°C and said intermediate temperature is
3 approximately in the range of 800°C to 900°C.

1 15. A process as recited in claim 1, wherein said substrate is chosen from
2 the group consisting essentially of monocrystalline silicon, polycrystalline silicon and
3 silicon islands in a silicon on insulation (SOI) substrate.

1 16. A process for fabricating an oxide, the process comprising:

2 (a) exposing a substrate to a first oxidizing ambient at a temperature below
3 a threshold temperature;

4 (b) exposing said substrate to a second oxidizing ambient at a temperature
5 above said threshold temperature; and

6 (c) cooling said substrate to a temperature below said threshold
7 temperature.

1 17. A process as recited in claim 16, wherein step (a) further comprises:
2 increasing an ambient temperature from an initial temperature to a first
3 temperature at a first rate;

4 increasing said ambient temperature from said first temperature to said
5 temperature below said threshold temperature at a second rate; and
6 growing at least a portion of the oxide.

1 18. A process as recited in claim 17, wherein said first temperature is in
2 the range of 750°C to 850°C and said first rate is approximately 50°C-125°C per minute.

1 19. A process as recited in claim 17, wherein said temperature below said
2 threshold temperature is approximately 800°C-900°C and said second rate is
3 approximately 10°C-25°C per minute.

1 20. A process as recited in claim 16, wherein said substrate is oxidizable
2 silicon and said threshold temperature is the viscoelastic temperature of silicon dioxide.

1 21. A process as recited in claim 16, wherein step (b) further comprises:
2 increasing an ambient temperature from a first temperature to a second
3 temperature at a rate of approximately 5-15°C/minute in an ambient oxygen concentration
4 of approximately 0%-5%;

5 increasing said ambient temperature from said second temperature to said
6 temperature above said threshold temperature at a rate of 5-10°C/min in an ambient
7 oxygen concentration of approximately 0%-5%; and
8 growing at least a portion of the oxide in an ambient oxygen concentration
9 of about 0-25%.

1 22. A process as recited in claim 16, wherein step (c) further comprises:
2 reducing an ambient temperature from said temperature above said
3 threshold temperature to approximately 800°C-900°C at a rate of about 2°C-5°C; and

4 reducing said ambient temperature to a boat pull temperature at a rate of
5 about 35°C-65°C per minute, wherein a first oxide portion formed in step (a) acts as a

6 stress sink to a second oxide portion formed in step (b) during at least a portion of said
7 cooling.

1 23. A process as recited in claim 16, wherein said substrate is oxidizable.

1 24. A process as recited in claim 16, wherein said substrate is chosen from
2 the group consisting essentially of monocrystalline silicon, polycrystalline silicon and
3 silicon islands in a silicon on insulation (SOI) substrate.

1 25. A process as recited in claim 22, wherein said first oxide portion has a
2 thickness in the range of 7.5 to 20Å.

1 26. A process as recited in claim 22, wherein said second oxide portion
2 has a thickness in the range of 2 to 12 Å.

1 27. A process as recited in claim 16, wherein the oxide has a thickness of
2 15 Å or less.

1 28. A process as recited in claim 16, further comprising:
2 (d) forming a high-k dielectric layer over the oxide.

1 29. A process as recited in claim 16, further comprising introducing
2 nitrogen in step (a) so that a first oxide portion formed in step (a) is nitrated silicon
3 dioxide.

1 30. A process as recited in claim 16, wherein said threshold temperature is
2 the viscoelastic temperature of SiO₂.

1 31. A process as recited in claim 22, wherein said threshold temperature is
2 the viscoelastic temperature of SiO₂.